

## integrated channel

Software-defined integrated channel with uniquely flexible pipeline design for on-premises, virtualised and cloud deployments.

**Pebble Integrated Channel is a single software product deployable in all necessary scenarios for playout. With powerful signal processing capabilities, outstanding configurability, interfacing capacity and a huge variety of stream or file types, it replicates in software all the functionality of a traditional broadcast playout chain made up of single-purpose devices performing dedicated functions, and it can be customised for all your channel types, from tightly scheduled 'static' channels to highly reactive channels with multiple content formats, complex graphics, and live inserts.**

### **Deployment scenarios include:**

- On-premises channels up to UHD
- SMPTE 2110 IP-based channels
- Cloud deployed channels
- Hybrid on-premises and cloud channel combinations
- Cloud pop up channels

### Choose your own path

The same software is used to process on-premises UHD channels or cloud channels. Channel hardware support is determined by your objectives and no longer by software limitations. If a channel requires uncompressed SMPTE 2110 or is transport stream based, the only differences become your deployment environment and investment choices.

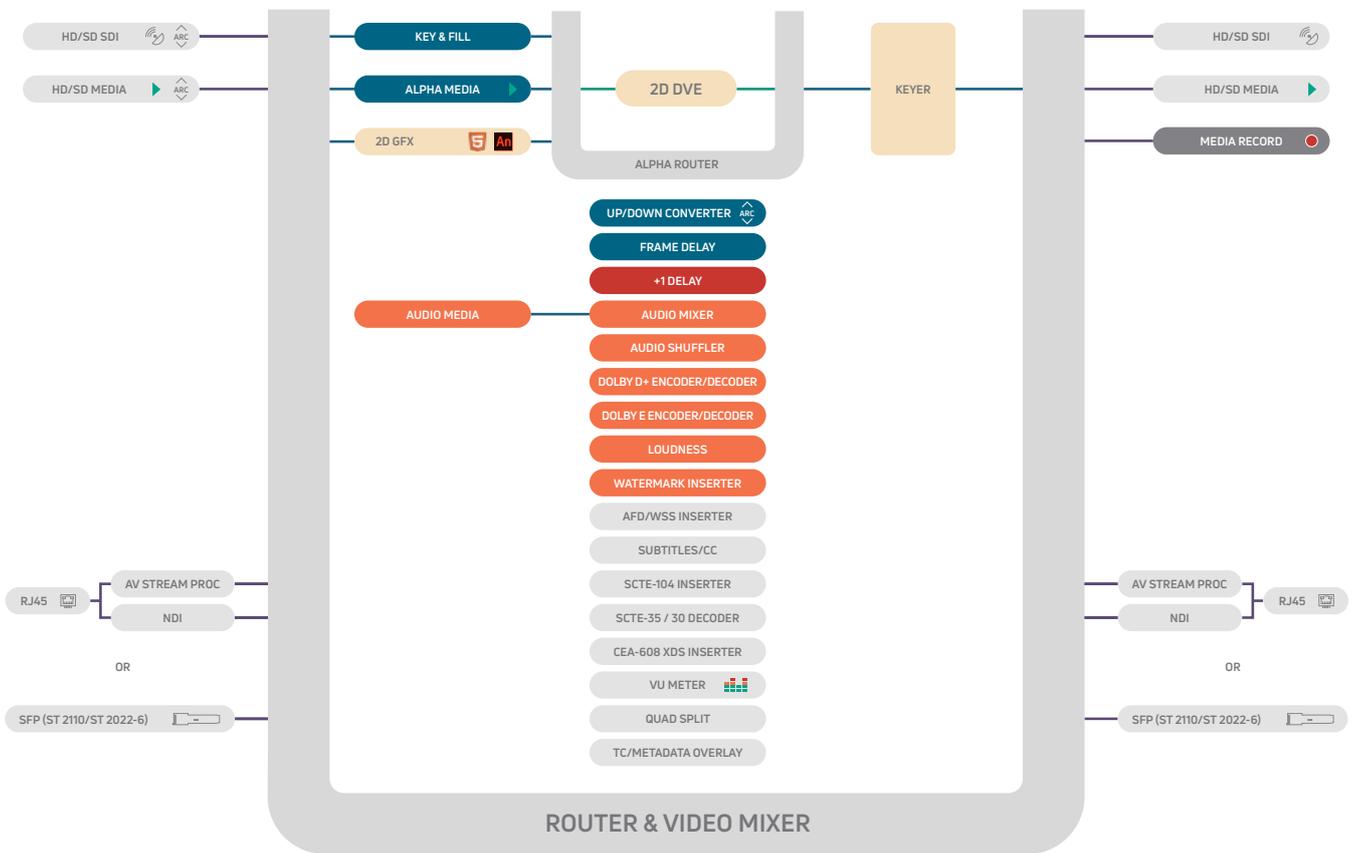
### The Evolution to IP-based Services

Broadcast businesses are increasingly looking to evolve IP-based services alongside more traditional delivery methods. Hosting technology within generic data centres or in the public cloud delivers service agility and saves cost, enabling the operator to be situated remotely in a standard data centre environment with all the cost savings that delivers. But not all playout scenarios are possible in the cloud, many are not economically feasible either.

Consequently, Pebble Integrated Channel can support all deployment scenarios with the same core software.

### Configurability and Flexibility

Pebble Integrated Channel’s software-defined channels are configurable to meet the exact requirements of each service in each deployment. All implementations share the same underlying processing architecture and operate under the control of the Pebble Automation system, making it easy to mirror channels for simultaneous playout from on-premises SDI as well as cloud-based compressed channel distribution.



- Video Processing
- Audio Processing



## Key Features:

- Leverages the full power of Pebble Automation's flexible playlist:
  - Can handle dynamic changes to schedules
  - Full validation of media and playout elements
- Simple to use channel design and editing tools with drag and drop
- Comprehensive graphics functionality (2D native or optional 3D plugin – GPU required)
- Flexible audio routing management
- Popular hypervisors supported
- Flexible IP inputs and outputs; supports MPEG2-TS, NDI and SMPTE 2022-6, SMPTE 2110
- Playback from most Network Attached Storage (NAS) systems supporting Server Message Block (SMB)

## Key Benefits:

- Full specification and cloud channels with the same software
- Enables migration to an IP and virtualised environment without compromising your channel design or playout operations
- Delivers cost savings by isolating the operator from the technology, as Pebble Automation operators can be located within a standard data centre environment rather than a purpose-built broadcast facility
- Offers a proven solution with multichannel deployments
- Meets the exact requirements of each service thanks to its highly configurable architecture.



## IP Inputs and Outputs

Pebble Integrated Channel can support multiple IP inputs and outputs formats including NDI, SMPTE 2110, SMPTE 2022-6, MPEG2-TS over IP with MPEG2 or H.264 compressed video and compressed audio. Quarter resolution MPEG2-TS IP outputs can be used for monitoring purposes either in the **Pebble Automation** Smart Panels or alternative IP stream players. Pebble Integrated Channel can leverage the flexibility of using IP to carry video and audio in a variety of formats.

- ST 2110 20,30,31,40 (Hardware dependent)
- ST 2022-6 (Hardware dependent)
- MPEG2-TS [H.264 and MPEG2 video supported]
- NDI

Using ST 2110 or ST 2022-6 we support seamless redundant streams according to ST 2022-7.



## NMOS Integration

Pebble Integrated Channel supports the Network Media Open Specification (NMOS) suite as standardised today including IS-04 up to IS-07 plus conforms to JT-NM TR-1000-1 and best current practices for natural grouping and secure communications. Reliable seamless switching of IP streams for live environments are also supported through ST 2022-7. Telemetry data can be shared with third party

Network Management Systems and other management layers.



## Ultra-High Definition and HDR support

Pebble Integrated Channel can support the massive bandwidths required for UHD using the ProRes codec while hardware accelerators must currently be used for XAVC/AVC and AVC Ultra for resolutions of up to 2160p60. HDR input and file capture is supported in Perceptual Quantizer (PQ) and Hybrid Log Gamma (HLG).

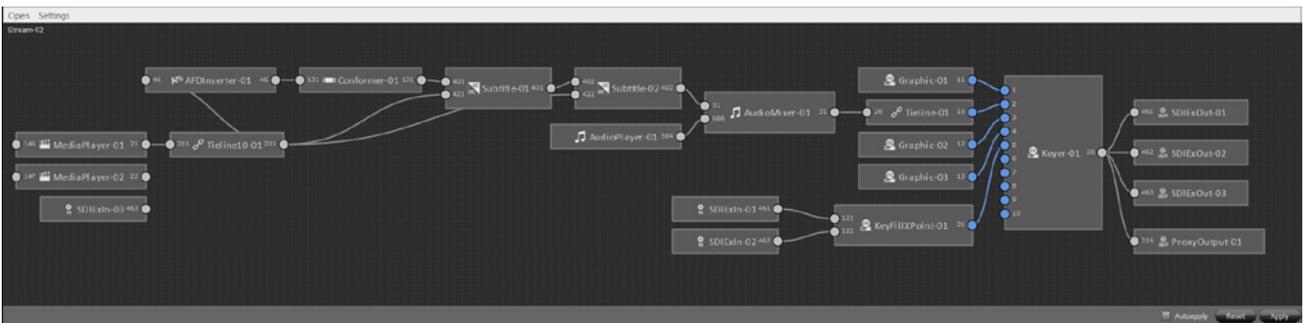
## Integrated Control and Monitoring

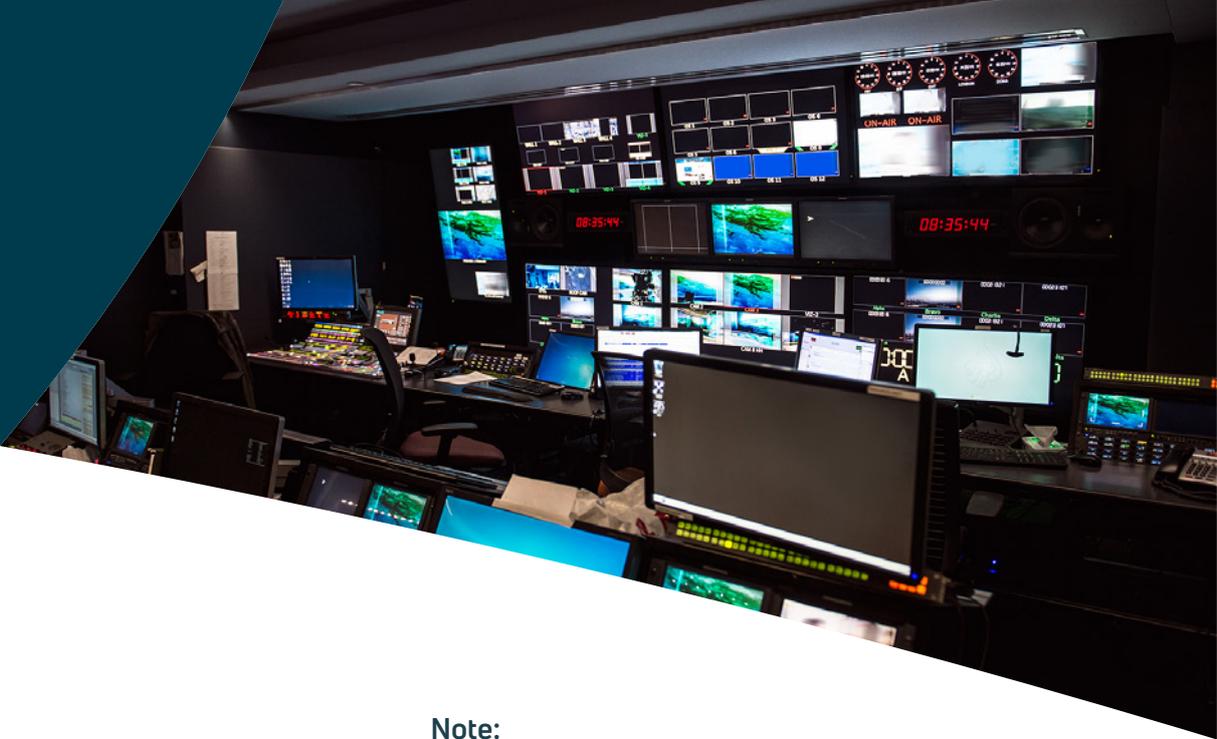
Pebble offers an integrated remote control and monitoring solutions for all channel implementations. Pebble Remote is based on cloud technology but deployable on-premises or on the public cloud, where combinations of systems can be controlled from the same location. Multi-site operations, disaster recovery systems and hybrid on-premises/cloud solutions can all be integrated into the same control platform.

## Software defined pipeline

The software pipeline can be configured to deliver the required video and audio workflows, making it easy to specify the order in which processes such as graphics overlay, Digital Video Effect and Aspect Ratio Conversion are handled within the playout chain.

**A flexible pipeline editor enables the logical devices of the pipeline to be configured to meet the exact channel requirements. Configurations can be edited at any time should the channel requirements change.**





## Video Player

The Video Player can decode and play back video from any of the supported SD, HD or UHD codecs. Each pipeline can support up to 5 video players depending on the hardware chosen to support the software.

### Video player features include:

- Seamless back-to-back playback of mixed resolution clips
- Playing clips of single frame duration
- Playing clips whilst the file is transferring
- Playing mixed framerate content with advanced motion adaptive de-interlacer and scaler (hardware required).

## Note:

- Representative files should be supplied to Pebble for testing
- Supports MOV QuickTime self-contained or reference files
- Up to 64 audio channels/tracks of stored audio per ID (codec dependent)
- Up to 16 audio output channels for SDI
- Up to 256 audio flows with 64 tracks in ST 2110-30 (theoretical limit)
- Audio sample size can be 16- and 24-bit PCM at 48KHz depending on codec.

The table below lists the range of supported file wrappers and codecs for playback:

STANDARD	CODECS	WRAPPERS
SD	DVCPRO25, DVCPRO50 & DVCAM DV IMX 30, 40, 50 MPEG2 I Frame & Long GOP	AVI, MOV, MXFOPAtom, MXFOP1a, GXF, LXF AVI, MOV, GXF, LXF AVI, MXFOP1a AVI, MOV, MXFOP1a, GXF, MPG
HD	XDCAM HD, XDCAM EX, XDCAM 422 DVCPRO HD AVC-Intra DNxHD H264/AVC MPEG2 I Frame & Long GOP XAVC AVC-Ultra AS-11/DPP ProRes	MXFOP1a AVI, MOV, MXFOP1a, MXFOPAtom, GXF, LXF MXFOP1a, LXF MOV, MXFOP1a, MXFOPAtom MP4, MOV AVI, MOV, MXFOP1a, GXF, MPG MXF MXFOP1b MXF MOV
UHD	ProRes XAVC AVC-Ultra	MOV MXF MXFOP1b

### Video Recorder

The Pebble Integrated Channel pipeline can be configured with Video Recorders which are controlled by Pebble Automation ingest operations. These include dubbing, scheduled recording or crash record. The Video Recorder can also be controlled by secondary record events and used for clean recording of live programs.

**Key features include:**

- Encoding profiles, allowing Pebble Automation users to easily change format and codec
- Exporting of clips as they are being recorded
- Inbuilt low-resolution proxy browse transcoding
- Key frame generation
- Multi-Destination recording using XDCAMHD422 or H.264 proxy files.

### Master Control

Each Pebble Integrated Channel pipeline has an internal video/audio router. The pipeline editor connects logical devices and routes video to external inputs and outputs. The router also includes master control functionality with several transition types including V-fade, cut-fade, fade-cut and mix. A second Alpha Router connects video and key sources to the keyers. Router tie lines are available for passing video from the main router to the alpha router.

### Delay Service

If there is a requirement to delay a channel, perhaps for a +1 hour catch up service or to delay for time zone variations, the optional +hr delay can be configured into pipelines hosted on a standalone server dedicated to delay services or included within the channel pipeline. It is also possible to uniquely brand a delay service with a continuous graphic or one that is

controlled from the master playlist. There are two modes of time delay available within Pebble Integrated Channel, one is designed for baseband delay and the second mode is for compressed MPEG2 transport streams (TS). The key benefit of using the TS delay is that only a single encode is required for a typical baseband and compressed time delay, instead of multiple stages of re-encoding.

### Video Conformer

This is a configurable module that provides Aspect Ratio and Up/Down conversion. Operations can be applied to both live and clip-based video. The video conformer will up or down convert video if the resolution of the input video does not match that configured for its output. For instance, the Aspect Ratio Converter (included with the Video Player) ensures that the output video resolution will always match that of the channel. Additional conformers can also be positioned anywhere in the pipeline; to generate down-converted video for a simulcast output for example.

The Video Conformer is configurable for each received Active Format Descriptor (AFD) code and will aspect ratio convert video depending upon the AFD code present on its input video. This AFD code, once, inserted into the Conformer output video, will change with aspect ratio conversion. If the video into the conformer does not have an AFD value, Pebble Integrated Channel will apply a default AFD and ARC. Pebble Integrated Channel complies with SMPTE-2016.

When UHD is a requirement, hardware accelerated scaling and de-interlacing ensures that material that is ingested or played out can be scaled to the correct resolution required.

The table below lists the range of supported file wrappers and codecs for the video recorder:

STANDARD	CODECS	WRAPPERS
SD	DVCPRO25, DVCPRO50, DVCAM DV IMX 30, 40, 50 MPEG2 I Frame & Long GOP	MOV, MXFOP1a, MXFOPAtom MOV MXFOP1a MOV, MXFOP1a
HD	XDCAM HD, XDCAM EX, XDCAM 422 DVCPRO HD AVC-Intra DNxHD H264/AVC MPEG2 I Frame & Long GOP XAVC ProRes	MXFOP1a MOV, MXFOP1a, MXFOPAtom MXFOP1a, MXFOPAtom MXFOP1a, MXFOPAtom MP4, MOV MXFOP1a, MOV MXF MOV
UHD	ProRes XAVC (Specific Hardware Required) AVC-Ultra (Specific Hardware Required)	MOV MXF MXFOP1b



### AFD Inserter

This overwrites the AFD data on incoming video with a value from the Pebble Automation playlist, otherwise AFD will pass through unchanged. When positioned upstream of the Conformer, the AFD values in the playlist can change the aspect ratio of the output video.

### Keyers

The pipeline can be configured with up to 3 keyers enabling outputs to multiple platforms, each with unique branding. For example, both an SD simulcast, and a streaming web service could be output from the pipeline, each with different graphics. Each keyer has 10 input layers which can be fed video and key from any of the Alpha Router sources. Sources include the Pebble Integrated Channel graphics players, 2D DVE's, optional 3D graphics, external graphics devices and the timeline video sources from the main router.

### 2D Graphics

Depending on complexity and the host server capabilities each Pebble Integrated Channel pipeline supports up to 10 graphics players that are controlled by secondary playlist events, or manually from the Pebble Automation Smart Panel. Static graphic formats include TGA, GIF, JPEG, PNG, SVG and SWF. Animated graphics are supported through sequential TGA and GIF or SWF (Adobe) files, and graphics can be sized and positioned from within the playlist.

Graphics are created using Adobe Animate CC and can be designed to receive dynamic textual data from the playlist. The data can be included in the traffic schedule or manually entered by the automation operator. Data for text crawls can be supplied from XML or RSS feeds.

Adobe graphics can also control Pebble Integrated Channel DVE's. This provides a powerful method for coordinating graphics and DVE effects from a single secondary event.

### HTML5 Graphics

Live HTML5 overlays and animated HTML5 graphics are supported where Pebble Automation can schedule graphic events that are rendered in real-time within Pebble Integrated Channel. Dynamic text and image fields within the graphics can be controlled through automation and defined in the playlist.

Live graphics created by a third party can be scheduled in automation and a pre-defined graphic URL is rendered on top of active video. The third-party application can then control the active URL and trigger the positioning and display of their graphical elements.

### Key and Fills

External graphics devices under the control of the playlist can input their key and fill video directly into the pipeline – meaning Pebble Integrated Channel can cater for a wide range of graphics requirements whilst accommodating legacy graphics products and workflows.

### 2D DVE

Pebble Integrated Channel Digital Video Effects are used to resize and position video on the screen. Five 2D box DVE's are available for squeeze back and picture in picture. These can be controlled by playlist secondary events or from an Adobe graphic.

### 3D Graphics Plugins

Multiple options exist for graphics plugins. Some solutions may require an optional GPU for graphics rendering.



## Audio Players

The pipeline can be configured with 5 Audio Players that will play pre-recorded audio files under the control of playlist secondary events. In this way, multi-lingual Audio Overs from separate audio files can be supported. The audio level, program duck level, fade in/out time and track mixing are all configurable.

## Audio Support

- Advanced audio shuffling and substitution using SMTPE 377-4 tagged tracks;
- ISO639-2 Descriptor
- RFC5646 Descriptor
- Private sub tag support (RFC5646 only)

## Formats

- WAV
- BWF/BWAV
- AIFF
- Bit Depths (16,24,32)
- Sample rate 48kHz
- Multi-lingual Audio overs up to 8, dynamic ducking for each language
- Dolby Digital and Digital Plus Encoding and Decoding
- Dolby E Encoding and Decoding
- Downmix (2.0 -> 5.1)
- Upmix (5.1 -> 2.0)

## Audio Shufflers

The Audio Shufflers are controlled by **Pebble Automation** and can change the arrangement of the audio tracks. The track shuffle for each event can be scheduled or edited manually from the playlist. It can also be automatically controlled from **Pebble Automation** by reading the audio language tags of the source media and comparing these with the preconfigured channel output mapping. The channel can be configured with primary, secondary, and tertiary output mappings to allow audio substitution if first or second choice languages are unavailable.

## SCTE Inserter

The Pebble Integrated Channel pipeline can be configured to insert SCTE-35 data into its IP transport stream output or SCTE-104 messages into its uncompressed outputs. The data instructs when downstream devices should switch away and re-join a Pebble Integrated Channel feed, typically to allow the insertion of local programming or commercials. SCTE output data is controlled from the playlist either through explicitly scheduled secondary start and stop events or automatically using a combination of appropriately tagged primary events and rules which determine the type and timing of SCTE messages to be sent.

## Loudness Processing

Optional loudness processing dynamically adjusts the loudness of audio in real-time to ensure that Pebble Integrated Channel output follows ITU-R.BS1770-4 based international loudness recommendations including ATSC A/85, EBU R128,

ARIB TR-B32, and FreeTV OP59. Loudness is adjusted on both clip and live feed ployout based upon preconfigured profiles. Profiles can be scheduled on an event by event basis

## Subtitle/Closed Caption Inserter

This is an optional plug-in and provides Closed Captions and Subtitle support. Multiple inserters can be configured for each pipeline. Each inserter will be driven from a separate subtitle/caption file stored on a Pebble Integrated Channel storage location, making it possible to output multiple subtitle or closed caption languages.

### Supported Subtitle features include:

- Multi-language support with validation
- WST and OP47 subtitle insertion into configurable VBI lines and teletext pages.
- Insert open subtitles into video
- Line 21, CEA-608 and CEA-708 closed caption insertion
- Supported file formats include EBU .stl, .pac, .chk, .890, .scr, .scc, .xml (tt)
- DVB Bitmap

## SCTE Message Extraction

SCTE-35 messages in the MPEG2-TS inputs are fed to Pebble Integrated Channel and can be read and used by Pebble Automation to switch the local Pebble Integrated Channel output between the live feed and a regional playlist. SCTE-35 messages can also be output over MPEG2-TS.

## Packet 31 Insertion

The Pebble Integrated Channel pipeline can be configured to insert Packet 31 data into the program identifier (PID) assigned to the teletext data of an IP transport stream output. The data instructs when downstream devices should switch away and re-join a Pebble Integrated Channel feed, typically to allow the insertion of local programming.

## Dolby Encoders and Decoders

Dolby Encoders and Decoders are logical devices that can be positioned anywhere in the pipeline. For example, it is possible to decode Dolby E or D to discrete PCM audio from live sources, add audio voiceover and then encode to Dolby E or D.

## Watermarking

### Support for popular watermarking standards include:

- Nielsen
- Kantar Civolution





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